



## Appendix B

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Basin (A) 9.5 acres

Hyd. Group D Soil A35 - Bone Land

Average of 4 homes/acre: 42% imperv. surface

PerVIOUS: 9.5 acres Fair condition landscape

CN=97

Tc Overland 220' 0.25%

Ditch 1200' 0.25% slope

Impervious: CN=98 4.0 acres

Tc Overland 100' 0.5% pavement

Shallow 250' 0.25% wood gutter

Ditch 1200' 0.25% slope

Basin (B) 19.7 acres all Hyd. Group D

Average of 1 home per 2 acres: 8% impervious

PerVIOUS: 12.1 acres disturbed 2nd growth CN=86

Tc Overland 200' 0.5%

Shallow 250' 0.25%

Ditch 990' 0.25%

Impervious CN=98 2.1 acres

Tc Overland 100' 0.25% wood-pavement

Ditch 490' 0.25%

SCS Soil Survey for Gray Harbor, Washington and Pacific Counties 1986

Flow by the sea

PROJECT NO.

Basin (C) 6.7 acres

Hydro. Group D

5.3 acres forest - 50% Impervious CN = 97  
 1.4 acres 2nd growth forest CN = 96

Permeous 4.1 acres 3.4 CN = 89.5

To Overland 50' 0.25%

Shallow 150' 0.25%

Ditch 570' 0.25%

CMP 180 0.25%

Imperv. Overland 50' 1.7% paved

2.6 Shallow 150' 0.25%

was Ditch 570' ↓

CN = 98 CMP 180 ↓

Rainfall Inches

6-month 2.0

2-year 3.0

10-year 4.0

25-year 4.8

100-year 5.8

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BASIN SUMMARY

BASIN ID: A                    NAME:

SBUH METHODOLOGY

TOTAL AREA.....:	9.50 Acres	BASEFLOWS:	0.00 cfs	
RAINFALL TYPE.....:	TYPE1A		PERV	IMP
PRECIPITATION.....:	3.00 inches	AREA...:	5.50 Acres	4.00 Acres
TIME INTERVAL.....:	10.00 min	CN.....:	92.00	98.00
		TC.....:	46.04 min	29.49 min

ABSTRACTION COEFF: 0.20

TcReach - Sheet L: 220.00 ns:0.1500 p2yr: 3.00 s:0.0025

TcReach - Channel L: 120.00 kc:17.00 s:0.0025

impTcReach - Sheet L: 100.00 ns:0.0110 p2yr: 3.00 s:0.0025

impTcReach - Shallow L: 250.00 ks:27.00 s:0.0025

impTcReach - Channel L:1200.00 kc:17.00 s:0.0025

PEAK RATE: 3.62 cfs VOL: 1.91 Ac-ft TIME: 490 min

BASIN ID: B                    NAME:

SBUH METHODOLOGY

TOTAL AREA.....:	14.20 Acres	BASEFLOWS:	0.00 cfs	
RAINFALL TYPE.....:	TYPE1A		PERV	IMP
PRECIPITATION.....:	3.00 inches	AREA...:	12.10 Acres	2.10 Acres
TIME INTERVAL.....:	10.00 min	CN.....:	86.00	98.00
		TC.....:	67.27 min	12.48 min

ABSTRACTION COEFF: 0.20

TcReach - Sheet L: 200.00 ns:0.1500 p2yr: 3.00 s:0.0025

TcReach - Shallow L: 250.00 ks:11.00 s:0.0025

TcReach - Channel L: 980.00 kc:17.00 s:0.0025

impTcReach - Sheet L: 100.00 ns:0.0110 p2yr: 3.00 s:0.0025

impTcReach - Channel L: 490.00 kc:17.00 s:0.0025

PEAK RATE: 3.32 cfs VOL: 2.16 Ac-ft TIME: 490 min

BASIN ID: C                    NAME:

SBUH METHODOLOGY

TOTAL AREA.....:	6.70 Acres	BASEFLOWS:	0.00 cfs	
RAINFALL TYPE.....:	TYPE1A		PERV	IMP
PRECIPITATION.....:	3.00 inches	AREA...:	4.10 Acres	2.60 Acres
TIME INTERVAL.....:	10.00 min	CN.....:	89.50	98.00
		TC.....:	31.15 min	19.45 min

ABSTRACTION COEFF: 0.20

TcReach - Sheet L: 50.00 ns:0.1500 p2yr: 3.00 s:0.0025

TcReach - Shallow L: 150.00 ks:11.00 s:0.0025

TcReach - Channel L: 530.00 kc:17.00 s:0.0025

TcReach - Channel L: 180.00 kc:21.00 s:0.0025

impTcReach - Sheet L: 50.00 ns:0.0110 p2yr: 3.00 s:0.0025

impTcReach - Shallow L: 150.00 ks:11.00 s:0.0025

impTcReach - Channel L: 530.00 kc:17.00 s:0.0025

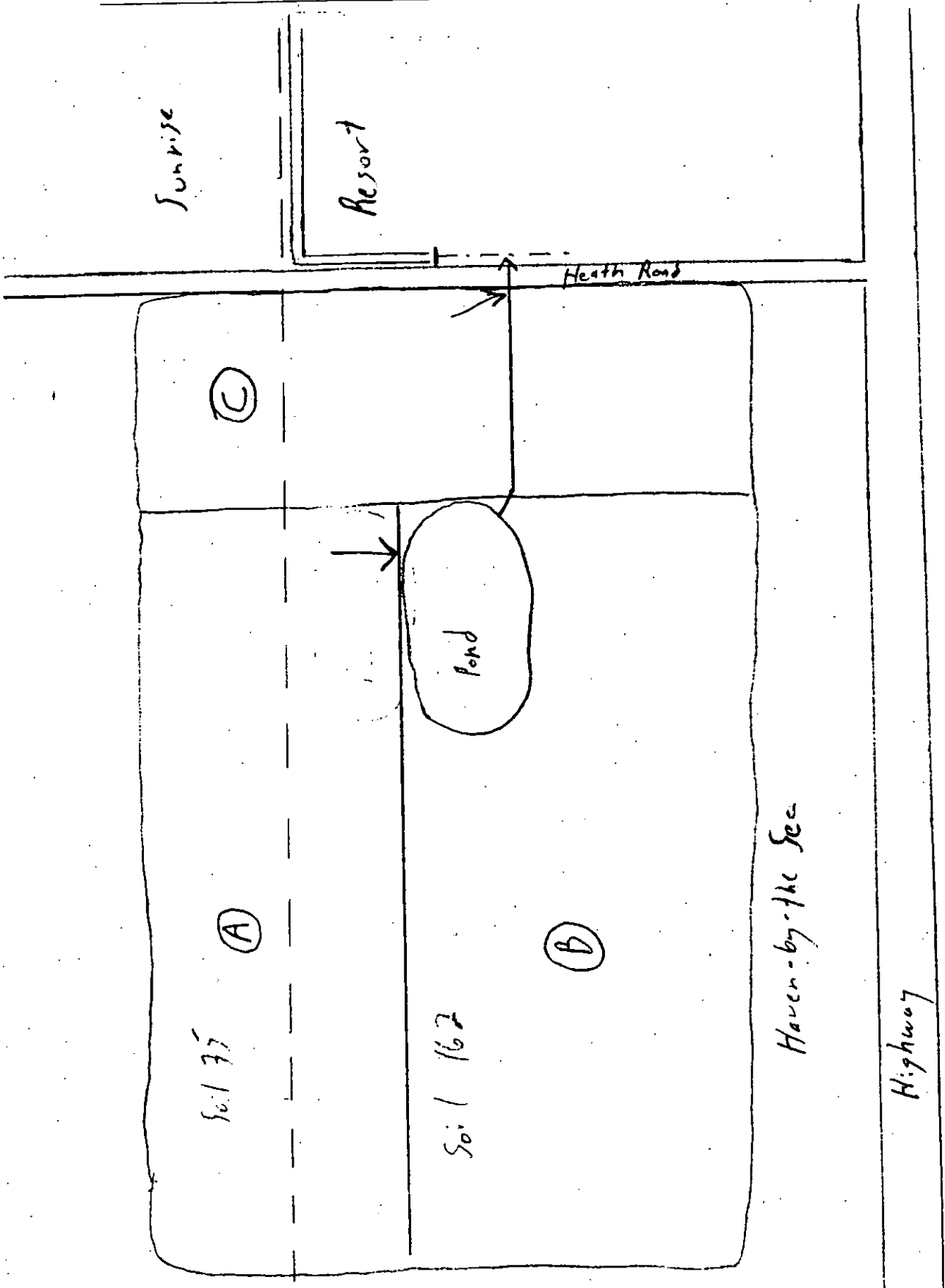
impTcReach - Channel L: 180.00 kc:21.00 s:0.0025

PEAK RATE: 2.68 cfs VOL: 1.26 Ac-ft TIME: 480 min

f:149393/wu/hc-cu

Haven by the Sea  
Waterworks Schematic

3/29/99



STAGE STORAGE TABLE

CUSTOM STORAGE ID No. Lake  
Description:

STAGE <---STORAGE-->			STAGE <---STORAGE-->			STAGE <---STORAGE-->			STAGE <---STORAGE-->		
(ft)	---cf---	--Ac-Ft-	(ft)	---cf---	--Ac-Ft-	(ft)	---cf---	--Ac-Ft-	(ft)	---cf---	--Ac-Ft-
97.00	0.0000	0.0000	98.30	13900	0.3191	99.60	52650	1.2087	100.90	112075	2.5729
97.10	700.00	0.0161	98.40	16200	0.3719	99.70	56425	1.2953	101.00	117000	2.6860
97.20	1400	0.0321	98.50	18500	0.4247	99.80	60200	1.3820	101.10	124000	2.8466
97.30	2100	0.0482	98.60	20800	0.4775	99.90	63975	1.4687	101.20	131000	3.0073
97.40	2800	0.0643	98.70	23100	0.5303	100.00	67750	1.5553	101.30	138000	3.1680
97.50	3500	0.0803	98.80	25400	0.5831	100.10	72675	1.6684	101.40	145000	3.3287
97.60	4200	0.0964	98.90	27700	0.6359	100.20	77600	1.7815	101.50	152000	3.4894
97.70	4900	0.1125	99.00	30000	0.6887	100.30	82525	1.8945	101.60	159000	3.6501
97.80	5600	0.1286	99.10	33775	0.7754	100.40	87450	2.0076	101.70	166000	3.8108
97.90	6300	0.1446	99.20	37550	0.8620	100.50	92375	2.1206	101.80	173000	3.9715
98.00	7000	0.1607	99.30	41325	0.9487	100.60	97300	2.2337	101.90	180000	4.1322
98.10	9300	0.2135	99.40	45100	1.0354	100.70	102225	2.3468	102.00	187000	4.2929
98.20	11600	0.2663	99.50	48875	1.1220	100.80	107150	2.4598	102.00	187000	4.2929

Storm	Inches	Inflow to Lake	Outflow from Lake 12-Inch Outlet @ MP	Peak Lake El.	Flow to Health Pond
2-year	3.0	7.04	1.26	101.34	3.14
10-year	4.0	10.37	1.50	102.16	4.49
25-year	4.8	13.11	1.62	102.61	5.57
100-year	5.8	16.56	1.74	103.11	7.46
24" Outlet @ MP					
2-year	3.0	7.04	2.38	100.80	3.14
10-year	4.0	10.37	4.17	101.08	5.40
25-year	4.8	13.11	5.75	101.29	7.40
100-year	5.8	16.56	7.31	101.62	9.82

Date of Session: 3/29/99 3:35:57 pm  
CLEARHIS

### HAVEN BY THE SEA - PRELIMINARY HYDROLOGY

#### B. RUN THE HYDROLOGY WITH A 24-INCH CULVERT AT HAVEN LAKE OUTLET

ADD A B 1  
7.0420 cfs 4.6303 ac-ft 8.17 hrs

ADD C 1 2  
10.1040 cfs 6.1683 ac-ft 8.17 hrs

End program file F:\149383\WW\HAVEN.pgm

Executing Program file: F:\149383\WW\HAVEN.pgm

ADD A B 1  
7.0420 cfs 4.6303 ac-ft 8.17 hrs

LPOOL	Description	MatchQ	PeakQ	Sto	Dis	PkStg	OutQ	hyd
1	"Route thru Lake"	1	1	Lake	12-Cuvl	2		
Volume	Route thru Lake	7.04	7.04	Lake	12-Cuvl	101.34	1.26	2
	140832.20 cf							
	Route thru Lake	0.00	7.04	Lake	12-Cuvl	101.34	1.26	2
	140832.20 cf							
	Invalid Hydrograph							

MOVE C to 3  
3.1420 cfs 1.5379 ac-ft 8.00 hrs

ADD 2 3 5  
3.1420 cfs 4.3337 ac-ft 8.00 hrs

End program file F:\149383\WW\HAVEN.pgm

CHANGE PRECIP 4.00  
A B C  
LSTEND

Executing Program file: F:\149383\WW\HAVEN.pgm

ADD A B 1  
10.3738 cfs 6.7308 ac-ft 8.17 hrs

LPOOL	Description	MatchQ	PeakQ	Sto	Dis	PkStg	OutQ	hyd
1	"Route thru Lake"	1	1	Lake	12-Cuvl	2		
Volume	Route thru Lake	10.37	10.37	Lake	12-Cuvl	102.16	1.50	2
	210252.71 cf							



Route thru Lake 0.00 7.04 Lake 12-Cuvl 101.34 1.26 2  
140832.20 cf  
Invalid Hydrograph

MOVE C to 3  
4.4862 cfs 2.1838 ac-ft 8.00 hrs

ADD 2 3 5  
4.4862 cfs 6.6497 ac-ft 8.00 hrs

End program file F:\149383\WW\HAVEN.pgm

CHANGE PRECIP 4.80  
A B C  
LSTEND

Executing Program file: F:\149383\WW\HAVEN.pgm

ADD A B 1  
13.1065 cfs 8.4511 ac-ft 8.17 hrs

LPOOL 1 "Route thru Lake" 1 1 Lake 12-Cuvl 2  
Description MatchQ PeakQ Sto Dis PkStg OutQ hyd  
Volume  
Route thru Lake 13.11 13.11 Lake 12-Cuvl 102.61 1.62 2  
273966.83 cf

Route thru Lake 0.00 7.04 Lake 12-Cuvl 101.34 1.26 2  
140832.20 cf  
Invalid Hydrograph

MOVE C to 3  
5.5694 cfs 2.7078 ac-ft 8.00 hrs

ADD 2 3 5  
5.5694 cfs 7.7984 ac-ft 8.00 hrs

End program file F:\149383\WW\HAVEN.pgm

CHANGE PRECIP 5.80  
A B C  
LSTEND

Executing Program file: F:\149383\WW\HAVEN.pgm

ADD A B 1  
16.5639 cfs 10.6314 ac-ft 8.17 hrs

LPOOL 1 "Route thru Lake" 1 1 Lake 12-Cuvl 2  
Description MatchQ PeakQ Sto Dis PkStg OutQ hyd  
Volume  
Route thru Lake 16.56 16.56 Lake 12-Cuvl 103.11 1.74 2  
357898.26 cf

Route thru Lake 0.00 7.04 Lake 12-Cuvl 101.34 1.26 2  
140832.20 cf  
Invalid Hydrograph

MOVE C to 3  
6.9252 cfs 3.3681 ac-ft 8.00 hrs

ADD 2 3 5  
7.4590 cfs 8.9978 ac-ft 8.17 hrs

End program file F:\149383\WW\HAVEN.pgm

## B. RUN THE HYDROLOGY WITH A 24-INCH CULVERT AT HAVEN LAKE OUTLET

CHANGE PRECIP 3.00  
A B C  
LSTEND

Executing Program file: F:\149383\WW\HAVEN.pgm

ADD A B 1  
7.0420 cfs 4.6303 ac-ft 8.17 hrs

LPOOL	Description	MatchQ	PeakQ	Sto	Dis	PkStg	OutQ	hyd
1	"Route thru Lake"	1	7.04	Lake	24-Cuvl	100.80	2.38	2
Volume	Route thru Lake							
	107302.89 cf							
	Route thru Lake	0.00	7.04	Lake	12-Cuvl	101.34	1.26	2
	140832.20 cf							
	Invalid Hydrograph							

MOVE C to 3  
3.1420 cfs 1.5379 ac-ft 8.00 hrs

ADD 2 3 5  
3.1485 cfs 4.3110 ac-ft 16.00 hrs

End program file F:\149383\WW\HAVEN.pgm

CHANGE PRECIP 4.00  
A B C  
LSTEND

Executing Program file: F:\149383\WW\HAVEN.pgm

ADD A B 1  
10.3738 cfs 6.7308 ac-ft 8.17 hrs

LPOOL	Description	MatchQ	PeakQ	Sto	Dis	PkStg	OutQ	hyd
1	"Route thru Lake"	1	10.37	Lake	24-Cuvl	101.08	4.17	2
Volume	Route thru Lake							
	122260.08 cf							

Route thru Lake 0.00 7.04 Lake 12-Cuvl 101.34 1.26 2  
140832.20 cf  
Invalid Hydrograph

MOVE C to 3  
4.4862 cfs 2.1838 ac-ft 8.00 hrs

ADD 2 3 5  
5.3985 cfs 7.0516 ac-ft 13.00 hrs

End program file F:\149383\WW\HAVEN.pgm

CHANGE PRECIP 4.80

A B C

LSTEND

Executing Program file: F:\149383\WW\HAVEN.pgm

ADD A B 1  
13.1065 cfs 8.4511 ac-ft 8.17 hrs

LPOOL 1 "Route thru Lake" 1 1 Lake 24-Cuvl 2  
Description MatchQ PeakQ Sto Dis PkStg OutQ hyd  
Volume  
Route thru Lake 13.11 13.11 Lake 24-Cuvl 101.29 5.75 2  
137451.23 cf

Route thru Lake 0.00 7.04 Lake 12-Cuvl 101.34 1.26 2  
140832.20 cf  
Invalid Hydrograph

MOVE C to 3  
5.5694 cfs 2.7078 ac-ft 8.00 hrs

ADD 2 3 5  
7.4003 cfs 9.2925 ac-ft 11.17 hrs

End program file F:\149383\WW\HAVEN.pgm

CHANGE PRECIP 5.80

A B C

LSTEND

Executing Program file: F:\149383\WW\HAVEN.pgm

ADD A B 1  
16.5639 cfs 10.6314 ac-ft 8.17 hrs

LPOOL 1 "Route thru Lake" 1 1 Lake 24-Cuvl 2  
Description MatchQ PeakQ Sto Dis PkStg OutQ hyd  
Volume  
Route thru Lake 16.56 16.56 Lake 24-Cuvl 101.62 7.31 2  
160688.73 cf

Route thru Lake 0.00 7.04 Lake 12-Cuvl 101.34 1.26 2  
140832.20 cf  
Invalid Hydrograph

MOVE C to 3  
6.9252 cfs 3.3681 ac-ft 8.00 hrs

ADD 2 3 5.  
9.8164 cfs 12.1294 ac-ft 9.67 hrs

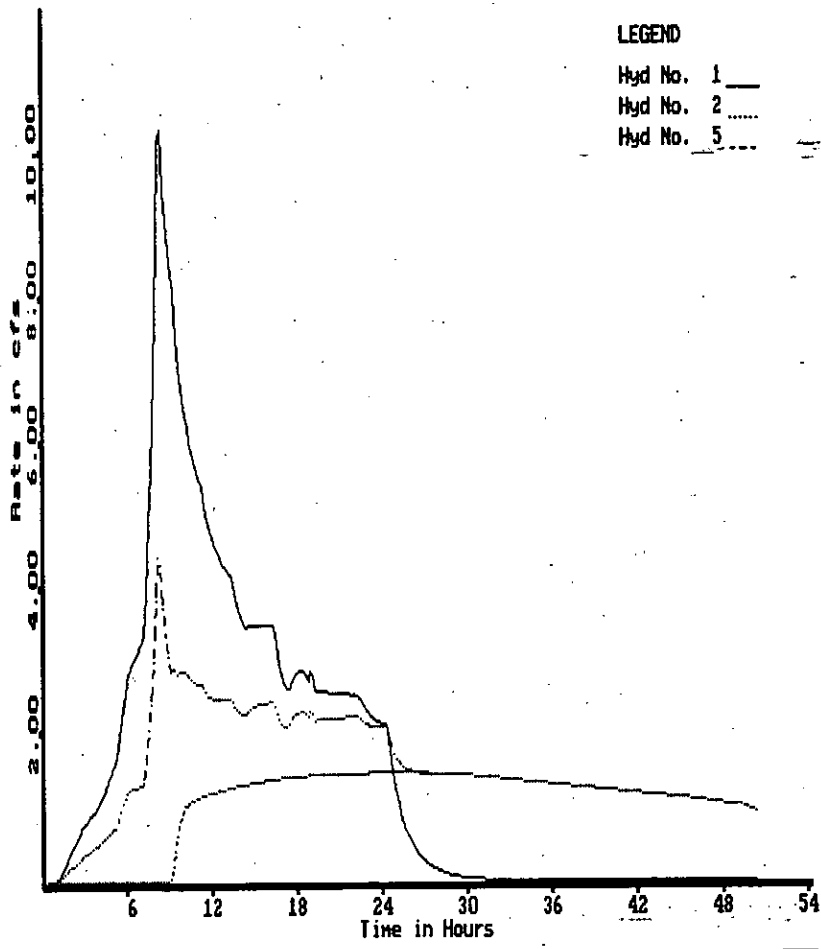
End program file F:\149383\WW\HAVEN.pgm

LEGEND

Hyd No. 1 \_\_\_\_\_

Hyd No. 2 .....  
.....

Hyd No. 5 - - - - -



Hyd No.: 1

Rate: 10.37 cfs      Time: 8.17 hr  
Vol : 6.73 Ac-ft      Int: 10.00 min

Hyd No.: 2

Rate: 1.50 cfs      Time: 24.67 hr  
Vol : 4.47 Ac-ft      Int: 10.00 min

Hyd No.: 5

Rate: 4.49 cfs      Time: 8.00 hr  
Vol : 6.65 Ac-ft      Int: 10.00 min

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STAGE DISCHARGE TABLE

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INLET CONTROL CULVERT ID No. 24-Cuvl  
 Description: 18" CMP Lake Outlet  
 Diameter (ft): 2' 2.00 Entrance type: 1  
 Length (ft) : 440.00 Invert Elev : 100.00  
 Slope (ft/ft): 0.0025 No. of Clvrts: 1  
 Mannings n : 0.0240 Max Ponding el:104.00  
 Stg-Dis Increment : 0.10

STAGE (ft)	<--DISCHARGE--> ---cfs---	STAGE (ft)	<--DISCHARGE--> ---cfs---	STAGE (ft)	<--DISCHARGE--> ---cfs---	STAGE (ft)	<--DISCHARGE--> ---cfs---
100.00	0.0000	101.10	4.3435	102.20	8.4388	103.30	10.260
100.10	0.0318	101.20	5.0640	102.30	8.6203	103.40	10.410
100.20	0.0636	101.30	5.8103	102.40	8.7980	103.50	10.558
100.30	0.0953	101.40	6.8149	102.50	8.9723	103.60	10.703
100.40	0.1271	101.50	7.0384	102.60	9.1432	103.70	10.847
100.50	0.6441	101.60	7.2550	102.70	9.3110	103.80	10.989
100.60	1.1875	101.70	7.4654	102.80	9.4758	103.90	11.129
100.70	1.7587	101.80	7.6699	102.90	9.6378	104.00	11.267
100.80	2.3592	101.90	7.8692	103.00	9.7971		
100.90	2.9901	102.00	8.0635	103.10	9.9538		
101.00	3.6517	102.10	8.2533	103.20	10.108		

=====

STAGE DISCHARGE TABLE

INLET CONTROL CULVERT ID No. Cuvlert  
 Description: 12" CMP Lake Outlet  
 Diameter (ft): 1.00 Entrance type: 1  
 Length (ft) : 440.00 Invert Elev : 100.00  
 Slope (ft/ft): 0.0025 No. of Clvrts: 1  
 Mannings n : 0.0240 Max Ponding el:104.00  
 Stg-Dis Increment : 0.10

STAGE <--DISCHARGE-->	STAGE <--DISCHARGE-->	STAGE <--DISCHARGE-->	STAGE <--DISCHARGE-->
(ft) ---cfs---	(ft) ---cfs---	(ft) ---cfs---	(ft) ---cfs---
100.00	0.0000	101.10	1.1759
100.10	0.0112	101.20	1.2100
100.20	0.0225	101.30	1.2432
100.30	0.2099	101.40	1.2755
100.40	0.4171	101.50	1.3070
100.50	0.6455	101.60	1.3377
100.60	0.8952	101.70	1.3678
100.70	1.0283	101.80	1.3972
100.80	1.0671	101.90	1.4260
100.90	1.1046	102.00	1.4543
101.00	1.1408	102.10	1.4820
		102.20	1.5092
		102.30	1.5359
		102.40	1.5621
		102.50	1.5880
		102.60	1.6134
		102.70	1.6384
		102.80	1.6630
		102.90	1.6873
		103.00	1.7112
		103.10	1.7348
		103.20	1.7581
		103.30	1.7811
		103.40	1.8038
		103.50	1.8262
		103.60	1.8483
		103.70	1.8702
		103.80	1.8918
		103.90	1.9132
		104.00	1.9344

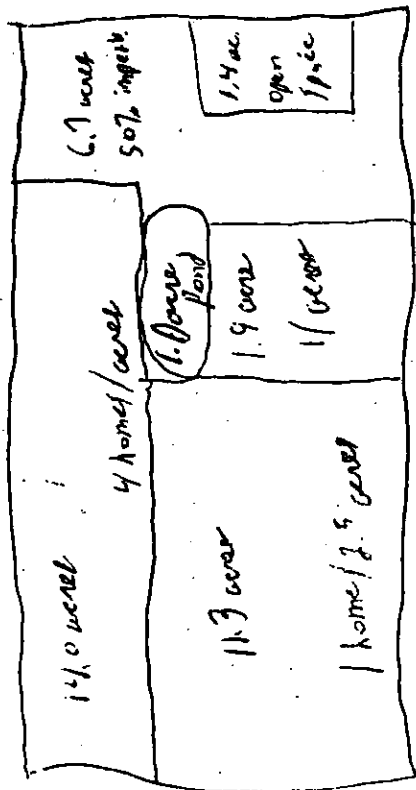


STAGE STORAGE TABLE

CUSTOM STORAGE ID No. Lake  
Description:

STAGE <---STORAGE-->			STAGE <---STORAGE-->			STAGE <---STORAGE-->			STAGE <---STORAGE-->		
(ft)	---cf---	--Ac-Ft-	(ft)	---cf---	--Ac-Ft-	(ft)	---cf---	--Ac-Ft-	(ft)	---cf---	--Ac-Ft-
97.00	0.0000	0.0000	98.80	25400	0.5831	100.60	97300	2.2337	102.40	244000	5.6015
97.10	700.00	0.0161	98.90	27700	0.6359	100.70	102225	2.3468	102.50	258250	5.9286
97.20	1400	0.0321	99.00	30000	0.6887	100.80	107150	2.4598	102.60	272500	6.2557
97.30	2100	0.0482	99.10	33775	0.7754	100.90	112075	2.5729	102.70	286750	6.5829
97.40	2800	0.0643	99.20	37550	0.8620	101.00	117000	2.6860	102.80	301000	6.9100
97.50	3500	0.0803	99.30	41325	0.9487	101.10	124000	2.8466	102.90	315250	7.2371
97.60	4200	0.0964	99.40	45100	1.0354	101.20	131000	3.0073	103.00	329500	7.5643
97.70	4900	0.1125	99.50	48875	1.1220	101.30	138000	3.1680	103.10	354500	8.1382
97.80	5600	0.1286	99.60	52650	1.2087	101.40	145000	3.3287	103.20	379500	8.7121
97.90	6300	0.1446	99.70	56425	1.2953	101.50	152000	3.4894	103.30	404500	9.2860
98.00	7000	0.1607	99.80	60200	1.3820	101.60	159000	3.6501	103.40	429500	9.8600
98.10	9300	0.2135	99.90	63975	1.4687	101.70	166000	3.8108	103.50	454500	10.434
98.20	11600	0.2663	100.00	67750	1.5553	101.80	173000	3.9715	103.60	479500	11.008
98.30	13900	0.3191	100.10	72675	1.6684	101.90	180000	4.1322	103.70	504500	11.582
98.40	16200	0.3719	100.20	77600	1.7815	102.00	187000	4.2929	103.80	529500	12.156
98.50	18500	0.4247	100.30	82525	1.8945	102.10	201250	4.6201	103.90	554500	12.730
98.60	20800	0.4775	100.40	87450	2.0076	102.20	215500	4.9472	104.00	579500	13.303
98.70	23100	0.5303	100.50	92375	2.1206	102.30	229750	5.2743	104.00	579500	13.303

Haven by the Sea



12.8"  
3150 → 4480

Soils # 153 Westport fine sand 0.70% slope Hyd. Soil Group A  
 # 162 Yaguina loamy fine sand Hyd. Soil Group D

Source: Soil Survey of Gray Harbor County Area SC 7/86

Subbasin (A) 9.3 acres Rural with 1 house/acre (15% impervious)

Previous

7.9 acres A soils pasture / 2nd growth forest  
 CN: 65 55 CN = 60

Tc Overland 300' 3% forest  
 Shallow 300' 1% dist. forest  
 ditch 200' 0.25%

Impervious 1.4 acres  
 Overland 50' 7%  
 Shallow 300' 1%  
 ditch 200' 0.25%

Subbasin (B) 7.3 acres 25% D soils 75% A soils  
 (6.8 acres) 4 homes/acre (42% impervious)

Previous 3.9 acres Fair Land/acre

1.0 acres D 97 > CN = 80.8  
 2.9 acres A 77

Tc Overland 150' 1% forest  
 Shallow 220' 0.5% grass  
 ditch 900' 0.25% grass

Impervious 1.4 acres

Tc Overland 100' 1%  
 Shallow 50' 1%  
 ditch 900' 0.25% grass

Silver Maple Drainage

Subbasin (C) 9.3 acres Rural 40% D soils 60% A soils

Permeous 7.9 acres: 2nd growth forest

3.2 acres D 86 CP = 67.4

4.7 acres A 95

Tc Overland 700' 3% forest

Ditch 1700' 0.25% grass

Impermeous 1.4 acres

Tc Shallow 50' 17% road

Overland 150' 17% forest

Ditch 1070' 0.25% grass

Rainfall inches

6-month 2.0

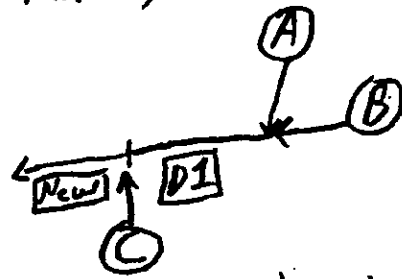
2-year 3.0

10-year 4.0

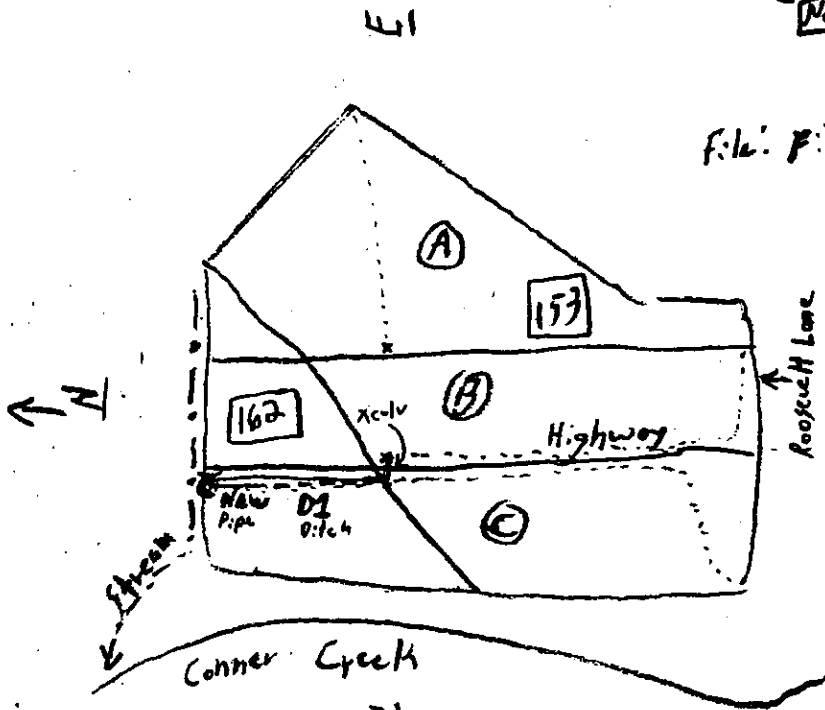
25-year 4.8

100-year 5.8

Model Schematic



File: P:\149383\ww\maple.pgm



162 Soils

D1 ~ 300' of existing Hwy Ditch

New - New 24" CMP connecting to local stream

1" ~ 470'

(Base Map: 1999 Color Aerial Photos)

Conner Creek

31

Silver Maple Drainage 3/31/99

Subsion (A) 9.3 acres Rural Homes ~1 home/acre

Subsion (B) 6.8 acres Med. Residential + 0.5 acre highway  
28 homes → 4 homes/acre

Subsion (C) 8.8 acres Rural, included 0.9 acres high-density residential  
+ 0.5 acre Highway

25.9 acres

**NORTH BEACH FLOOD MGT. STUDY  
SILVER MAPLE HYDROLOGY  
PRELIMINARY**

Date of Session: 3/31/99 5:12:26 pm

**Input Data**

BASIN A \*\* 9.300 3.00 10.00 59.34 TYPE1A 10.89  
 0.20 0.000 7.900 60.00 1.400 98.00 SBUH 24.00 484.00  
 SHEET 300.00 0.0300 0.4000 3.00  
 SHALLOW 300.00 0.0100 5.0000  
 CHANNEL 200.00 0.0025 17.0000  
 ISHEET 50.00 0.0200 0.0110 3.00  
 ISHALLOW 300.00 0.0100 8.0000  
 ICHANNEL 200.00 0.0025 17.0000

LSTEND

BASIN B \*\* 7.300 3.00 10.00 62.84 TYPE1A 20.06  
 0.20 0.000 3.900 80.80 3.400 98.00 SBUH 24.00 484.00  
 SHEET 150.00 0.0100 0.4000 3.00  
 SHALLOW 220.00 0.0050 11.0000  
 CHANNEL 900.00 0.0025 17.0000  
 ISHEET 100.00 0.0100 0.0110 3.00  
 ISHALLOW 50.00 0.0100 11.0000  
 ICHANNEL 900.00 0.0025 17.0000

LSTEND

BASIN C \*\* 9.300 3.00 10.00 70.90 TYPE1A 26.93  
 0.20 0.000 7.900 67.40 1.400 98.00 SBUH 24.00 484.00  
 SHEET 300.00 0.0300 0.4000 3.00  
 CHANNEL 1300.00 0.0025 17.0000  
 ISHEET 50.00 0.0100 0.0110 3.00  
 ISHALLOW 150.00 0.0100 5.0000  
 ICHANNEL 1070.00 0.0025 17.0000

LSTEND

DITCH D1 <sup>130</sup> 300.00 3.00 1.50 1.50 0.0025 0.0350 \*\* 0.00 0.00 10

PREACH New \*\* \*\* 24.00 150.00 0.0050 0.0240 0.00 0.00 \*\* UPDATE

Add new CMP  $f = 0.0015$   
 L<sub>3</sub>/30

MODEL RUNS

**2-year Storm**

CHANGE PRECIP 3.00

A B C

LSTEND

Executing Program file: F:\149383\WW\MAPLE.pgm

MOVE A to 1

*F:\149383\ww\maple*

```

0.8318 cfs    0.5424 ac-ft    8.00 hrs
MOVE  B to 2
2.2634 cfs    1.2070 ac-ft    8.00 hrs
ADD  1 2 3
3.0952 cfs    1.7495 ac-ft    8.00 hrs

```

```

ROUTE HYDROGRAPH 3 THROUGH REACH D1
--x-- --m-- -k*-- --Q*- --K-- --C-- -sto- -kin-
0.707 1.400 0.002 0.979 199 0.594 -0.020 0.055
2.94 cfs 1.26 fps 0.60 ft deep

```

```

ADD  C 3 5
3.7565 cfs    2.4683 ac-ft    8.17 hrs

```

```

ROUTE HYDROGRAPH 5 THROUGH REACH New
Reach  -Area- --Qact-- --QFull- %Full Ndepth --Dia- -Vact- -Vfull Basn
New    25.90   3.76   9.35  40.19 11.03 24.00 2.67 3.05

```

End program file F:\149383\WW\MAPLE.pgm

**10-year Storm**

```

CHANGE PRECIP 4.00
A      B      C
LSTEND

```

Executing Program file: F:\149383\WW\MAPLE.pgm

```

MOVE  A to 1
1.2489 cfs    0.9408 ac-ft    8.00 hrs
MOVE  B to 2
3.2884 cfs    1.7510 ac-ft    8.00 hrs
ADD  1 2 3
4.5373 cfs    2.6919 ac-ft    8.00 hrs

```

```

ROUTE HYDROGRAPH 3 THROUGH REACH D1
--x-- --m-- -k*-- --Q*- --K-- --C-- -sto- -kin-
0.663 1.441 0.001 0.983 174 0.589 -0.034 0.049
4.35 cfs 1.41 fps 0.75 ft deep

```

```

ADD  C 3 5
5.8251 cfs    3.9004 ac-ft    8.17 hrs

```

```

ROUTE HYDROGRAPH 5 THROUGH REACH New
Reach  -Area- --Qact-- --QFull- %Full Ndepth --Dia- -Vact- -Vfull Basn
New    25.90   5.83   9.35  62.33 14.38 24.00 2.96 3.05

```

End program file F:\149383\WW\MAPLE.pgm

**25-year Storm**

CHANGE PRECIP 4.80  
A B C  
LSTEND

Executing Program file: F:\149383\WW\MAPLE.pgm

MOVE A to 1  
1.7693 cfs 1.3132 ac-ft 8.00 hrs

MOVE B to 2  
4.1377 cfs 2.2001 ac-ft 8.00 hrs

ADD 1 2 3  
5.9070 cfs 3.5133 ac-ft 8.00 hrs

ROUTE HYDROGRAPH 3 THROUGH REACH D1

--x--	--m--	-k*--	--Q*--	--K--	--C--	-sto-	-kin-
0.632	1.460	0.001	0.986	161	0.585	-0.056	0.045
	5.70 cfs	1.53 fps	0.87 ft deep				

ADD C 3 5  
7.8283 cfs 5.1610 ac-ft 8.17 hrs

ROUTE HYDROGRAPH 5 THROUGH REACH New

Reach	-Area-	--Qact--	--QFull-	%Full	Ndepth	--Dia-	-Vact-	-Vfull	Basn
New	25.90	7.83	9.35	83.76	17.82	24.00	3.13	3.05	

End program file F:\149383\WW\MAPLE.pgm

### 100-year Storm

CHANGE PRECIP 5.80  
A B C  
LSTEND

Executing Program file: F:\149383\WW\MAPLE.pgm

MOVE A to 1  
2.5673 cfs 1.8287 ac-ft 8.00 hrs

MOVE B to 2  
5.2217 cfs 2.7725 ac-ft 8.00 hrs

ADD 1 2 3  
7.7890 cfs 4.6011 ac-ft 8.00 hrs

ROUTE HYDROGRAPH 3 THROUGH REACH D1

--x--	--m--	-k*--	--Q*--	--K--	--C--	-sto-	-kin-
0.599	1.476	0.001	0.988	148	0.581	-0.061	0.041
	7.55 cfs	1.66 fps	1.01 ft deep				

ADD C 3 5  
10.5851 cfs 6.8400 ac-ft 8.17 hrs

ROUTE HYDROGRAPH 5 THROUGH REACH New

Reach	-Area-	--Qact--	--QFull-	%Full	Ndepth	--Dia-	-Vact-	-Vfull	Basn
-------	--------	----------	----------	-------	--------	--------	--------	--------	------



New 25.90 10.59 -----Pressure Flow----- 3.37

End program file F:\149383\WW\MAPLE.pgm

6-month Storm

CHANGE PRECIP 2.00

A B C

LSTEND

Executing Program file: F:\149383\WW\MAPLE.pgm

MOVE A to 1  
0.5410 cfs 0.2469 ac-ft 8.00 hrs

MOVE B to 2  
1.3093 cfs 0.6964 ac-ft 8.00 hrs

ADD 1 2 3  
1.8503 cfs 0.9433 ac-ft 8.00 hrs

ROUTE HYDROGRAPH 3 THROUGH REACH D1

--x--	--m--	-k*--	--Q*--	--K--	--C--	-sto-	-kin-
0.763	1.284	0.004	0.972	252	0.598	-0.003	0.070
	1.74 cfs		1.07 fps		0.44 ft deep		

ADD C 3 5  
2.1710 cfs 1.2699 ac-ft 8.17 hrs

ROUTE HYDROGRAPH 5 THROUGH REACH New

Reach	-Area-	--Qact--	--QFull-	%Full	Ndepth	--Dia-	-Vact-	-Vfull	Basn
New	25.90	2.17	9.35	23.23	8.18	24.00	2.30	3.05	

End program file F:\149383\WW\MAPLE.pgm

NORTH BEACH FHR STUDY  
 JOHNSON MERCANTILE  
 PRELIMINARY HYDROLOGY  
 ASSUME 12" OUTLET WITH 3% SLOPE

Date of Session: 4/1/99 4:56:20 pm  
 CLEARHIS

CHANGE PRECIP 3.00  
 Johnson  
 LSTEND

Executing Program file: F:\149383\WW\JOHNSON.pgm

MOVE Johnson to 1  
           1.4351 cfs      0.5578 ac-ft      8.00 hrs

ROUTE HYDROGRAPH 1 THROUGH REACH Copalis  
 Reach      -Area-   --Qact--   --QFull-   %Full   Ndepth   --Dia-   -Vact-   -Vfull   Basn  
 Copalis      3.10      1.44      4.33   33.17   4.95   12.00   4.69   5.65

End program file F:\149383\WW\JOHNSON.pgm

CHANGE PRECIP 4.00  
 Johnson  
 LSTEND

Executing Program file: F:\149383\WW\JOHNSON.pgm

MOVE Johnson to 1  
           2.0729 cfs      0.7983 ac-ft      8.00 hrs

ROUTE HYDROGRAPH 1 THROUGH REACH Copalis  
 Reach      -Area-   --Qact--   --QFull-   %Full   Ndepth   --Dia-   -Vact-   -Vfull   Basn  
 Copalis      3.10      2.07      4.33   47.91   6.11   12.00   5.16   5.65

End program file F:\149383\WW\JOHNSON.pgm

CHANGE PRECIP 4.80  
 Johnson  
 LSTEND

Executing Program file: F:\149383\WW\JOHNSON.pgm

MOVE Johnson to 1  
           2.5925 cfs      0.9949 ac-ft      8.00 hrs

ROUTE HYDROGRAPH 1 THROUGH REACH Copalis  
 Reach      -Area-   --Qact--   --QFull-   %Full   Ndepth   --Dia-   -Vact-   -Vfull   Basn  
 Copalis      3.10      2.59      4.33   59.92   7.01   12.00   5.44   5.65

End program file F:\149383\WW\JOHNSON.pgm

CHANGE PRECIP 5.80  
 Johnson  
 LSTEND

Executing Program file: F:\149383\WW\JOHNSON.pgm

MOVE Johnson to 1  
3.2471 cfs 1.2438 ac-ft 8.00 hrs

ROUTE HYDROGRAPH 1 THROUGH REACH Copalis

Reach	-Area-	--Qact--	--QFull-	%Full	Ndepth	--Dia-	-Vact-	-Vfull	Basn
Copalis	3.10	3.25	4.33	75.05	8.17	12.00	5.70	5.65	

End program file F:\149383\WW\JOHNSON.pgm

=====
BASIN SUMMARY

BASIN ID: Johnson NAME: Copalis Beach road flooding
SBUH METHODOLOGY
TOTAL AREA.....: 3.10 Acres BASEFLOWS: 0.00 cfs
RAINFALL TYPE.....: TYPE1A PERV IMP
PRECIPITATION.....: 5.80 inches AREA...: 1.60 Acres 1.50 Acres
TIME INTERVAL.....: 10.00 min CN.....: 85.00 98.00
TC.....: 11.59 min 7.00 min
ABSTRACTION COEFF: 0.20
TcReach - Sheet L: 120.00 ns:0.1500 p2yr: 3.00 s:0.0300
TcReach - Channel L: 460.00 kc:21.00 s:0.0500
impTcReach - Sheet L: 100.00 ns:0.0110 p2yr: 3.00 s:0.0025
impTcReach - Shallow L: 250.00 ks:27.00 s:0.0025
impTcReach - Channel L:1200.00 kc:17.00 s:0.0025
PEAK RATE: 3.25 cfs VOL: 1.24 Ac-ft TIME: 480 min

Drainage Area: 3.1 acres

Soils: # 93 Mopang silt loam 5-30% slopes Hydrology: Soil Group B

~ 50% impervious

1 large store & parking lot  
 State Highway, adjacent residential road  
 6 homes

Cover is Fair Landscape

Johnson

Pervious

1.6 acres CN = 85

Tc Overland 120' 3% grass

Gutter/ditch 460' 5% street/ditch

Impervious

1.5 acres CN = 98

Tc Overland 50' 3% pavement

70' 3% grass

400' 5% street/ditch

<u>Rainfall</u>	<u>Inches</u>
6-month	2.0
2-year	3.0
10-year	4.0
25-year	4.8
100-year	5.8

(A) Silver Maple Report

① Install 120' of 30" N-12 culvert:

\$ 6,500

② Replace 30' of existing culvert with 30" N-12 culvert: \$ 1,500

Unit cost of N-12 pipe: \$50/linear foot installed:

Erosion control, fish protection

\$ 1,000

Total

\$ 9,000

(B) Haven-by-the-Sea

① Install 500' of 24" N-12 pipe

Unit cost: \$45/lf

\$ 22,500

② Install 2-48" Manholes

Unit cost: \$3,000/MH

6,000

③ Survey/Engineering (15%)

4,300

Total

\$ 33,000

(C) Rod's Report

Deepen 300' of ditch on average of 0.5 feet

Assume ditch is 4 feet wide

2.5 ft<sup>3</sup>/linear foot

750 ft<sup>3</sup> → 307 ft<sup>3</sup>

Excavate/haul: \$25/yd<sup>3</sup> × 307 yd<sup>3</sup>

\$ 7,500

Survey Support 2 crew-days × \$1,000/day

\$ 2,000

Erosion control, fish protection

\$ 1,000

\$ 3,750